



## INSULIN RESISTANCE IN PCOS WOMEN AND ITS CORRELATION WITH INFERTILITY- A PROSPECTIVE OBSERVATIONAL STUDY

### Obstetrics & Gynaecology

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### ABSTRACT

**Introduction:** Polycystic ovary syndrome (PCOS) is a common endocrine disorder among women of reproductive age, significantly associated with insulin resistance and infertility. This study aims to explore the correlation between insulin resistance and infertility in women diagnosed with PCOS. **Materials and Methods:** A prospective observational study was conducted involving women aged 18 years and above attending outpatient clinics at Shri B.M. Patil Medical College, Hospital and Research Centre. The inclusion criteria were based on the Rotterdam criteria for PCOS. Insulin resistance was assessed using the Homeostatic Model Assessment for Insulin Resistance (HOMA-IR), with values greater than 2.5 indicating insulin resistance. **Results:** Out of 42 women studied, 61.1% experienced infertility, with 64% showing signs of insulin resistance (HOMA-IR > 2.5). A significant correlation was found between higher Body Mass Index (BMI) and insulin resistance, with 82.3% of obese women demonstrating insulin resistance. **Conclusion:** The findings indicate a strong association between insulin resistance and infertility in women with PCOS, particularly among those with higher BMI. Addressing insulin sensitivity may improve reproductive outcomes in this population.

### KEYWORDS

Insulin Resistance, PCOS, Infertility

### INTRODUCTION

Polycystic ovary syndrome (PCOS) is one of the most prevalent endocrine disorders affecting women of reproductive age, characterized by a combination of hyperandrogenism, ovulatory dysfunction, and polycystic ovaries.<sup>[1]</sup> The syndrome is often accompanied by insulin resistance, which plays a crucial role in its pathophysiology and contributes significantly to associated reproductive issues, including infertility.<sup>[2]</sup>

Infertility is defined as the inability to conceive after one year of unprotected intercourse and can lead to significant emotional distress for affected individuals.<sup>[3]</sup> Among various causes of infertility, hyperinsulinemia due to insulin resistance has emerged as a notable factor influencing ovarian function and overall reproductive health.<sup>[4]</sup> Insulin not only regulates glucose metabolism but also plays a vital role in ovarian steroidogenesis, affecting ovulation and endometrial function.<sup>[5,6]</sup>

The prevalence of PCOS is particularly high in India, often referred to as "The Diabetes Capital of the World," highlighting the urgent need to understand the implications of insulin resistance in this population.<sup>[7,8]</sup> This study aims to investigate the correlation between insulin resistance and infertility among women diagnosed with PCOS.

### MATERIALS AND METHODS

This prospective observational study was conducted at BLDE (DU), Shri B.M. Patil Medical College, Hospital, and Research Centre, Vijayapura, following approval from the Institutional Ethics Committee. Women aged 18 years and above attending the outpatient clinic in the Department of Obstetrics and Gynecology were screened for inclusion. The inclusion criteria comprised women diagnosed with Polycystic Ovary Syndrome (PCOS) using the Rotterdam Criteria (2003). Exclusion criteria were women with other known endocrine disorders or ovarian pathologies to ensure the study focused solely on PCOS-related insulin resistance and infertility.

Eligible participants provided informed written consent before enrollment. A detailed clinical history was taken, including menstrual irregularities, symptoms of hyperandrogenism, weight gain, and infertility concerns. Anthropometric measurements, including body mass index (BMI), were recorded. Blood samples were collected to assess fasting glucose and fasting insulin levels, used to calculate the Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) using the formula:

$$\text{HOMA-IR} = \frac{\text{Fasting Glucose (mg/dL)} \times \text{Fasting Insulin (}\mu\text{U/mL)}}{405}$$

Participants with HOMA-IR values >2.5 were categorized as insulin

resistant. The data were stratified based on BMI categories to examine the relationship between obesity, insulin resistance, and infertility. Statistical analysis included chi-square tests to assess the association between variables, with a significance level set at  $p < 0.05$ .

### RESULTS

A total of 42 women diagnosed with PCOS were included in the study, with a mean age of 26 years. Among these, the most commonly reported symptom was infertility, observed in 26 women (61.9%), followed by menstrual disturbances in 10 women (23.8%). Other symptoms included weight gain in 4 women (9.5%) and excessive hair growth in 2 women (4.8%). Insulin resistance, defined as HOMA-IR >2.5, was present in 27 women (64%), with no cases of HOMA-IR <1.

**Table 1: Symptoms of Participants**

| Symptom                    | Number of Women | Percentage |
|----------------------------|-----------------|------------|
| Menstrual disturbances     | 10              | 23.8%      |
| Excessive facial/body hair | 2               | 4.8%       |
| Weight gain                | 4               | 9.5%       |
| Infertility                | 26              | 61.9%      |

The prevalence of insulin resistance was analyzed across different BMI categories. Women with a BMI >25 kg/m<sup>2</sup> had the highest incidence of insulin resistance (82.3%), followed by those with a BMI of 23–24.9 kg/m<sup>2</sup> (69.2%). In contrast, only 31.3% of women with a BMI of 18.5–22.9 kg/m<sup>2</sup> were insulin resistant, and no cases of insulin resistance were found in women with a BMI <18.5 kg/m<sup>2</sup>. This indicates a strong correlation between obesity and insulin resistance in PCOS women.

**Table 2: BMI and Insulin Resistance**

| BMI (kg/m <sup>2</sup> ) | Number of Women | No. of Women with HOMA-IR>2.5 | Percentage |
|--------------------------|-----------------|-------------------------------|------------|
| <18.5                    | 0               | 0                             | 0%         |
| 18.5 – 22.9              | 12              | 4                             | 31.3%      |
| 23 – 24.9                | 13              | 9                             | 69.2%      |
| >25                      | 17              | 14                            | 82.3%      |

Further analysis revealed that among the 26 women presenting with infertility, 23 (88%) were insulin resistant. Conversely, of the 16 women with non-infertility symptoms, only 32% had insulin resistance ( $p < 0.001$ ). These findings suggest a significant association between insulin resistance and infertility in PCOS women, highlighting its critical role in reproductive dysfunction.

### DISCUSSION

The findings of this study emphasize the strong correlation between insulin resistance and infertility in women with Polycystic Ovary

Syndrome (PCOS). Insulin resistance was present in 64% of the study population and was particularly high among women presenting with infertility (88%). These results are consistent with those of Karnatak et al. <sup>[1]</sup>, who reported a significant influence of insulin resistance on ovulation induction outcomes in PCOS. Karnatak's research demonstrated that addressing insulin resistance enhances the effectiveness of ovulation-inducing treatments, such as clomiphene citrate.

Insulin resistance contributes significantly to the pathophysiology of PCOS, leading to hyperinsulinemia and subsequent disruptions in ovarian function. Zhao et al. <sup>[3]</sup> highlighted that insulin resistance impacts various tissues in PCOS, including the ovaries, thereby impairing follicular maturation and ovulation. Similarly, Fica et al. <sup>[2]</sup> discussed that hyperinsulinemia exacerbates androgen production in theca cells and adversely affects endometrial receptivity, both of which play crucial roles in infertility among PCOS women.

This study also observed a strong link between obesity and insulin resistance. Women with a BMI  $>25$  kg/m<sup>2</sup> exhibited the highest prevalence of insulin resistance (82.3%), which supports the findings of Al-Jefout et al. <sup>[4]</sup> Their research reported that obesity aggravates hyperinsulinemia in PCOS phenotypes, further complicating fertility outcomes. Zia et al. <sup>[6]</sup> also emphasized the importance of weight management and lifestyle interventions as essential strategies for reducing insulin resistance and improving fertility in obese PCOS women.

These findings underline the importance of addressing insulin resistance through comprehensive management strategies. Calcaterra et al. <sup>[7]</sup> suggested that nutrition therapy, physical activity, and pharmacologic interventions, such as metformin, can significantly improve insulin sensitivity and reproductive outcomes in PCOS women. By restoring ovulatory function and reducing hyperandrogenism, such interventions offer a promising approach for managing infertility in this population.

## CONCLUSION

This study highlights the critical role of insulin resistance in the pathogenesis of infertility among women with Polycystic Ovary Syndrome (PCOS). A significant correlation was observed between insulin resistance and both obesity and infertility, emphasizing the metabolic challenges faced by these women. The findings underscore the need for targeted interventions, including lifestyle modifications and pharmacological treatments, to improve insulin sensitivity. Such measures can restore ovulatory function, reduce hyperandrogenism, and enhance fertility outcomes in PCOS patients. Addressing insulin resistance should be a cornerstone of PCOS management, especially for those presenting with obesity and infertility. Further research is needed to explore the long-term effects of these interventions on reproductive health.

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